

## Lesson 11

### Power Supply

## introduction

- The computer's components would not be able to operate without power.



### Tasks and specifications related to power supplies:

1. A power supply converts 110V or 220V AC current into the DC voltages that a computer needs to operate. These are +3.3VDC, +5VDC, -5VDC, +12VDC, and -12VDC.
2. *DC Voltage Regulation* to provide a very small tolerance of error to the devices receiving the power. Typically a  $\pm 5\%$  voltage differential is allowed through the specification for 12VDC, 5VDC, and 3.3VDC connections.
3. *Over Current Protection* specifies that the power supply should handle some level of abnormally high current to prevent fuses in the power supply from blowing unnecessarily.
4. *Input Under Voltage* specifies that if the voltage being supplied by the building drops below the normal operating level, it should not cause damage to the power supply itself — it will, however, likely cause your computer to turn off.
5. *Enerav Star* is a specification that defines how much

## Caution 1

- Power supplies contain transformers and capacitors that can discharge *lethal amounts of current even when disconnected from the wall outlet* for long periods.
- They are not meant to be serviced, especially by untrained personnel.
- *Do not attempt to open them or do any work on them. Simply replace and recycle them when they go bad.*

## Caution 2

- Input supply voltage (120V or 240V) may be static or configured via manual switching or automatic switching. Many laptops have automatic switching, while most desktop power supplies have manual switching.



## Power Supply Rating

- refers to the total wattage that the power supply can provide to devices within your computer.
- While ATX specification allows for power supplies to have ratings from 250 watts up to large ones at 800+ watts, most are typically around 500 watts to 600 watts.
- In most cases, bigger is better because systems that don't have enough power for devices can experience strange, intermittent problems

Device	Power
AGP video card	30–75W
PCI video card	30–35W
AMD Athlon XP 1.5MHz–2.5GHz	66–77W
AMD Athlon 64 3.0GHz–3.4GHz	89W
Intel Pentium 4 2.2GHz–2.4GHz	80W–90W
Intel Pentium 4 2.4GHz–3.0GHz	90W–105W
Intel Celeron Socket 478	45W–65W
ATX motherboard	40W–65W
PC133 RAM	12W
PC2100+ DDR RAM	10W
PC3200+ DDR2 RAM	7.5W
CD-ROM drive	20W
CD-RW drive	30W
DVD-ROM drive	25W
5,400RPM IDE hard drive	15W
7,200RPM IDE hard drive	25W
Floppy drive	5W

Network card or modem	5W
Sound card	7–10W
SCSI controller card	25W
FireWire or USB 2.0 controller card	40W
USB device	5W
FireWire device	0W
CPU or case fan	2W

1. **Locate on Table any devices that your system is going to contain and record the power usage.**
2. **Add up all of the wattages and divide your total by 80% (0.8) to give your system some extra room to grow and to accommodate any items you may have missed.**
3. **If you did not get a number that matches an available power supply rating, then choose a power supply with the next highest power rating.**



**ALLIED SWITCHING POWER SUPPLY**  
**MODEL: SL-275TFX (MAX275W)**

V~ INPUT	VOLTAGE		CURRENT		FREQUENCY				
	115V/230V~		6A/4A		60Hz/50Hz				
V== OUTPUT	+3.3V	+5V	+12V1	+12V2	-12V	+5VSB	BLK	GRN	GRY
	16A	12A	5A	13A	0.3A	2A	COM	PS-ON	P.G.
Combined Power	110W		60W	156W	3.6W	10W	RETURN	REMOTE	POK
	261W								

**1. DO NOT REMOVE THIS COVER.**  
**2. SELECT THE RIGHT VOLTAGE!**  
**3. WITH FAN SENSOR CONTROL.**

AL130XD

**AcBel ATX12V Power 470W**

MODEL NO. 型号(国牌) PC7004 开关电源(交流式电源供应器)

AC INPUT (交流输入)	115Vac 10A, 60Hz, 230Vac 6A, 50Hz					
DC OUTPUT (直流输出)	+3.3V	+5V	+12V1	+12V2	-12V	+5Vsb
	22A	25A	18A	18A	0.5A	2.5A
TOTAL POWER (总功率)	165W		312W		6W	12.5W
	401.5W				18.5W	

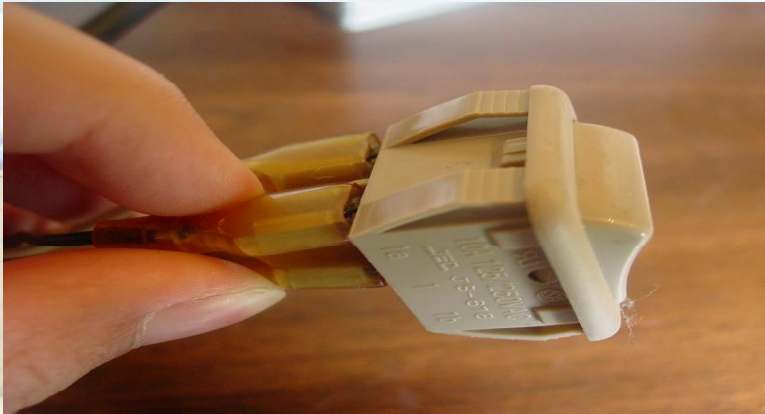
**CAUTION!** 警告  
 - HAZARDOUS VOLTAGE CONTAINED WITHIN THIS POWER SUPPLY!  
 - 內有危險电压! 有危險電壓!  
 - DO NOT OPEN COVER! NOT USER SERVICEABLE!  
 - 請勿打开机壳! (請勿打開機殼!)  
 - SELECT CORRECT VOLTAGE ACCORDING TO REGION (115V/230V)!  
 - 選擇正確的輸入电压! (選擇正確的輸入電壓值!)

WARRANTY VOIDED IF SEAL IS BROKEN OR REMOVED!  
 JS MADE IN CHINA 中国制造(中國製造)



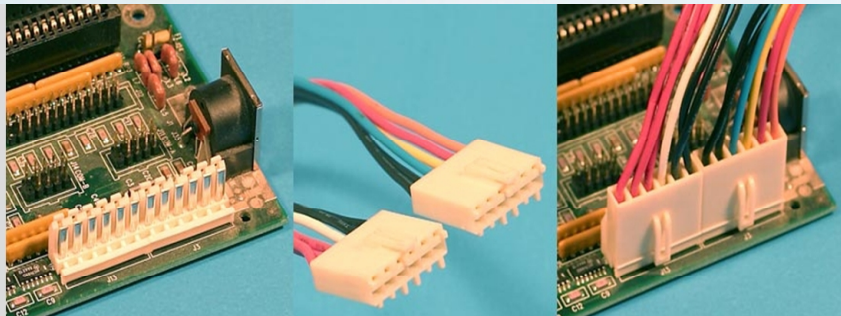


## AT power switch



It's now safe to turn off  
your computer.

## AT P8 & P9 connectors'



## Floppy Drive Power Connectors (Berg connectors)(Mini-Molex connector)

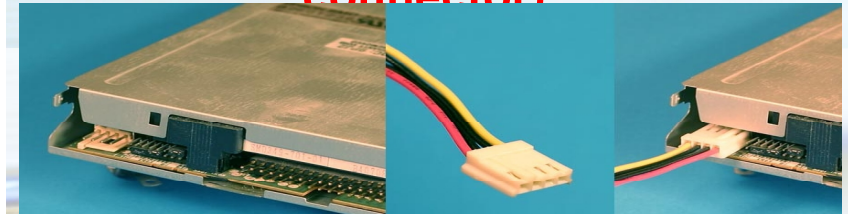


Table 6-3 Pin Configuration for the Floppy Power Connector

Pin	Signal	Color
1	+5VDC	Red
2	COM	Black
3	COM	Black
4	+12VDC	Yellow





## The peripheral connector (Molex)

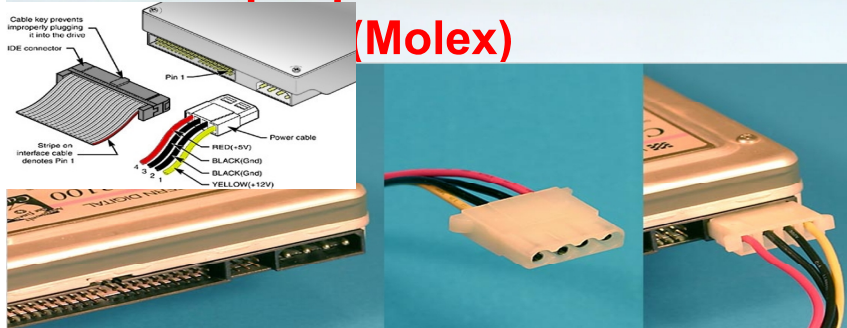
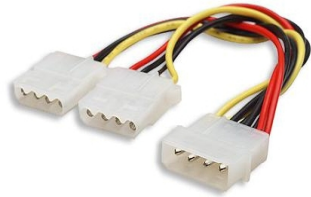


Table 6-4 Pin Configuration for the Peripheral Power Connector

Pin	Signal	Color
1	+12V1DC	Yellow
2	COM	Black
3	COM	Black
4	+5VDC	Red



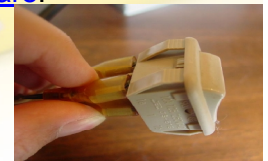
## ATX Power supply

The newer ATX main power connection, found on Pentium II computers and later,

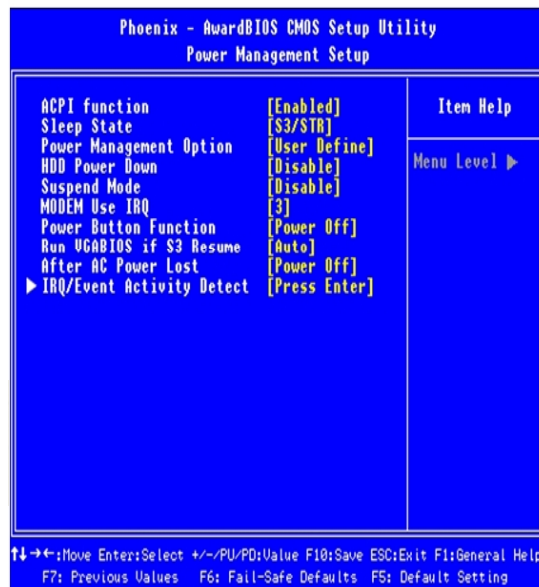
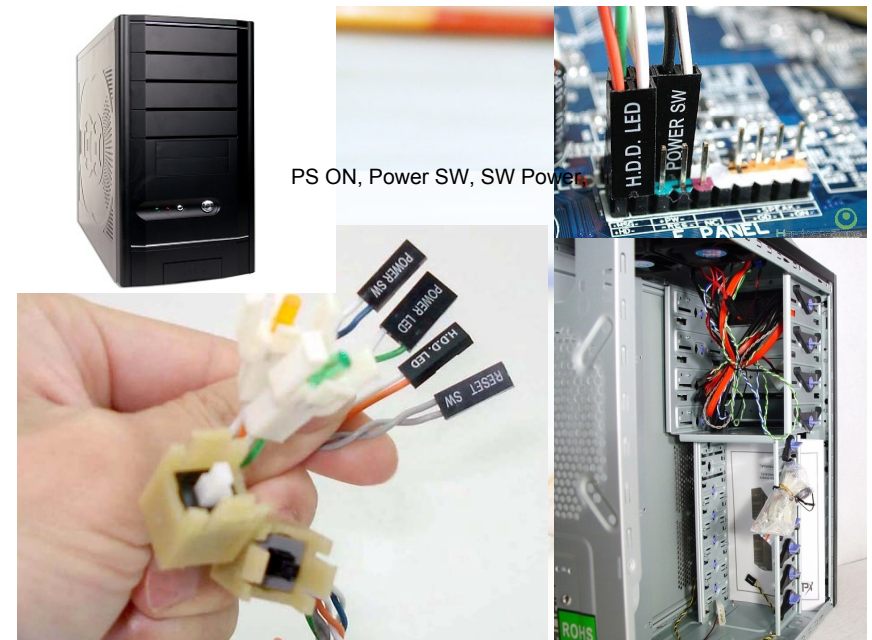
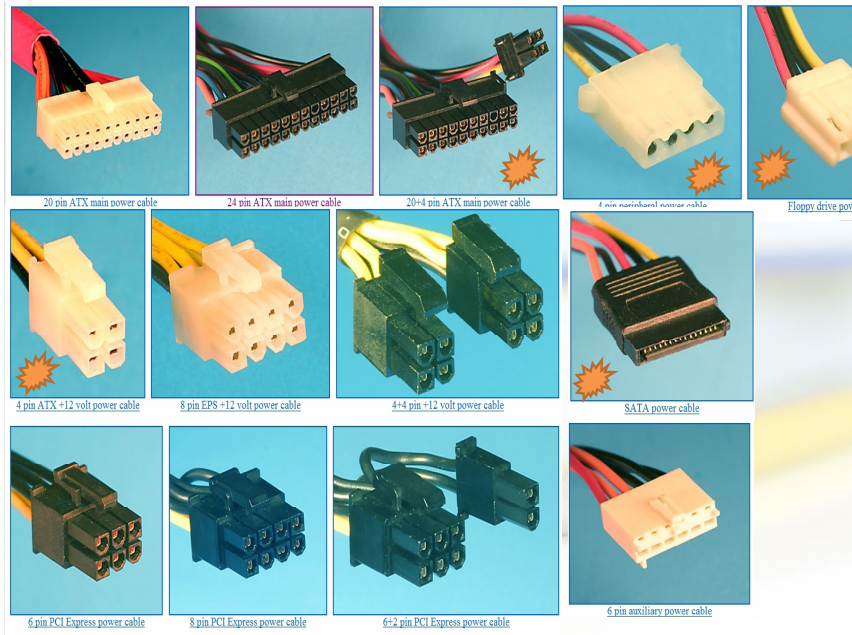


## The PS\_ON# feature

- Power supplies for ATX motherboards do not use a physical switch like your light switch, which allows a circuit to be open or closed; but rather your computer's power button is connected to the motherboard, and when you press the button, the motherboard determines what action will be taken.
- allows the motherboard to control the power supply though a soft power switch.
- In this design, the power supply runs in standby mode when plugged in with the system off.
- The power supply allows the motherboard to control the power state through the PS\_ON# feature. allowing the computer to be turned off via [software](#).







SETTING	PARAMETER
IPCA function	Enabled Disabled
Sleep State	S1/POS S3/STR
Power Management Option	User Define Min Saving Max Saving
HDD Power Down	Disabled 1, 2, 3, 4, 5, 6, 7 Min
Suspend Mode	Disabled 1, 2, 4, 6, 8, 10, 20, 30, 40 Min 1 Hour
MODEM Use IRQ	NA 3, 4, 5, 7, 9, 10, 11
Power Button Function	Suspend Power Off
Run VGABIOS if S3 Resume	Auto Yes No
After AC Power Lost	Last State Power On Power Off
IRQ/Event Activity Detect	Press <Enter> to access submenu.

## Floppy Drive Power Connectors (Berg connectors)(Mini-Molex connector)

Table 6-3 Pin Configuration for the Floppy Power Connector

Pin	Signal	Color
1	+5VDC	Red
2	COM	Black
3	COM	Black
4	+12VDC	Yellow



## The peripheral connector (Molex)

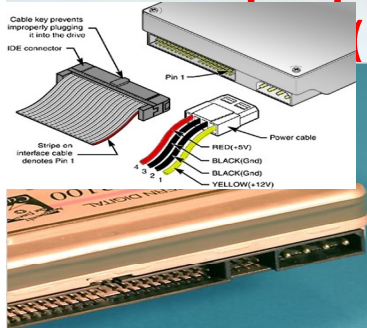
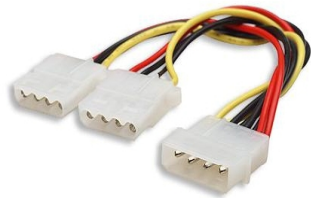
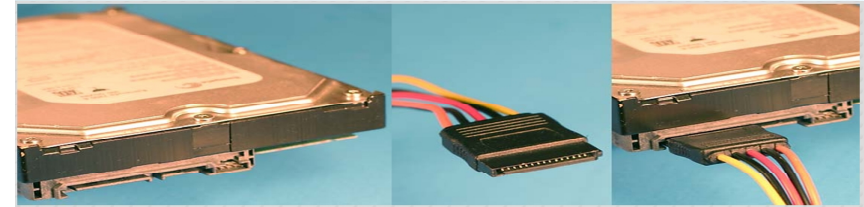


Table 6-4 Pin Configuration for the Peripheral Power Connector

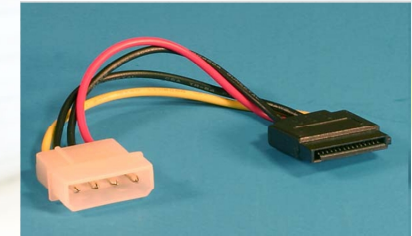
Pin	Signal	Color
1	+12V1DC	Yellow
2	COM	Black
3	COM	Black
4	+5VDC	Red



## SATA power cable

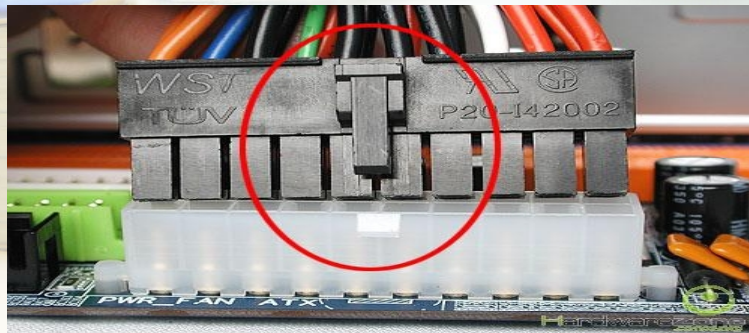


- SATA was introduced to upgrade the ATA interface (also called IDE) to a more advanced design.
- SATA includes both a data cable and a power cable.
- The power cable replaces the old [4 pin peripheral cable](#) and adds support for 3.3 volts

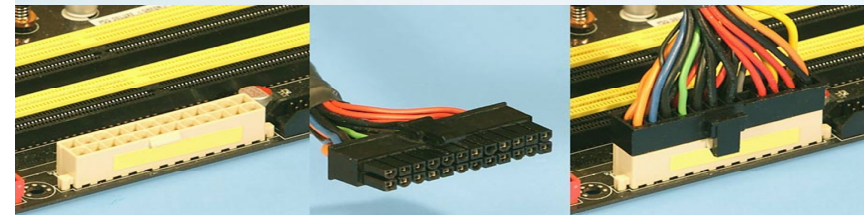


## The 20 pin ATX system connector

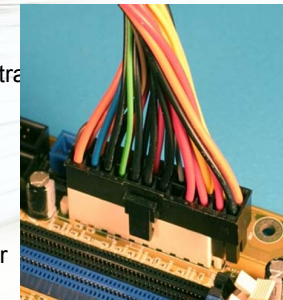
- a single 20-pin connector.
- This connector is much easier to work with than the dual connectors of the AT power supply.



## ATX 24 pin main power cable



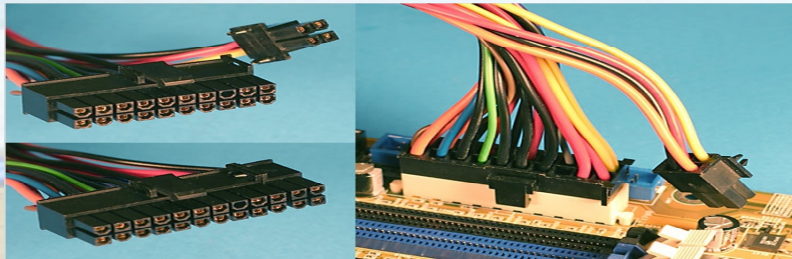
- The 24 pin main power connector was added in ATX12V 2.0 to provide extra power needed by PCI Express slots.
- The older [20 pin main power cable](#) only has one 12 volt line.
- The new 24 pin connector added one line apiece for around 3.3 5 and 12 volts



If you have an ATX power supply with a 24 pin main cable, it's okay to plug it into a motherboard with a 20 pin connector.

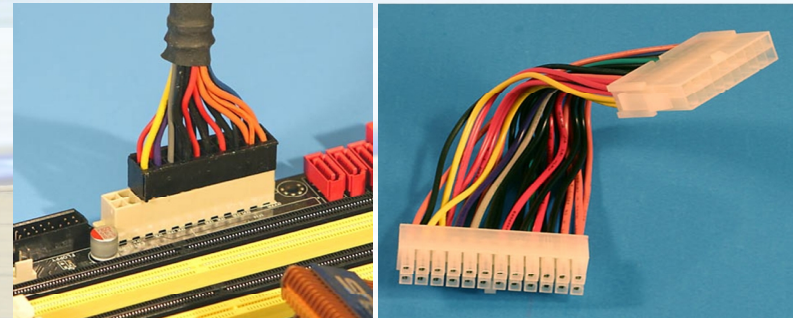


## ATX 20+4 pin main power cable



- Motherboards can come with either a [20 pin main power connector](#) or a [24 pin main power connector](#).
- Many power supplies come with a 20+4 cable which is compatible with both 20 and 24 pin motherboards.
- A 20+4 power cable has two pieces: a 20 pin piece, and a 4 pin piece.

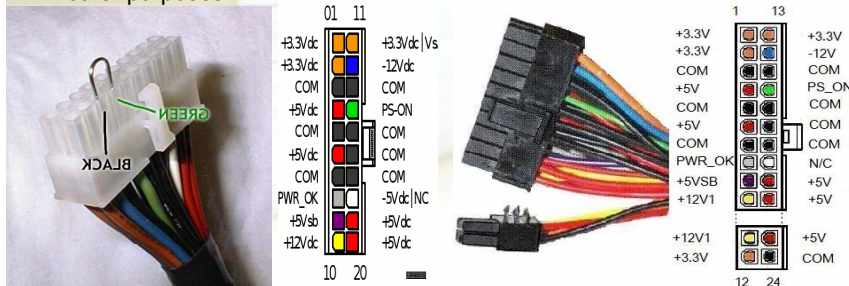
## Caution 3



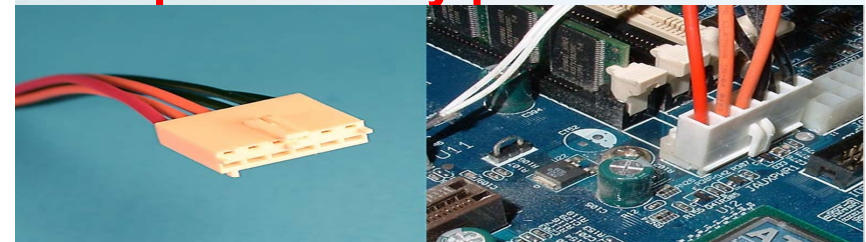
- You can plug a 20 pin ATX power cable into a motherboard with a [24 pin ATX connector](#). until you add a PCI Express card
- A 20 pin power cable only fits into one end of a 24 pin motherboard connector so you can't insert it incorrectly.
- But if the motherboard draws enough current, then you can overheat the 20 pins you're using on the 24 pin (burned)

## Tip

- The motherboard controls the power supply through pin #14 of the 20 pin connector or #16 of the 24 pin connector on the motherboard.
- This pin carries 5V when the power supply is in standby.
- It can be grounded to turn the power supply on without having to turn on the rest of the components.
- This is useful for testing or to use the computer ATX power supply for other purposes.



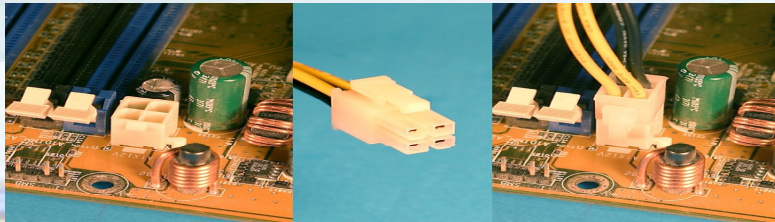
## 6 pin auxiliary power cable



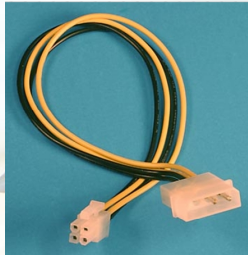
- The aux power cable was added to provide extra wattage to motherboards for 3.3 and 5 volts.
- This connector is rarely used anymore. It's most commonly found on older dual CPU AMD motherboards.



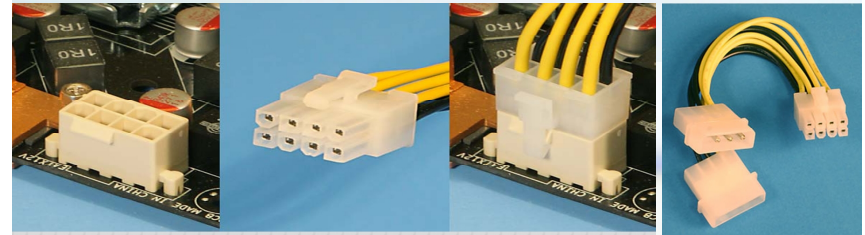
## 4 pin ATX +12 volt power cable "ATX12V" cable or "P4" cable



- Before this power cable was introduced there was just one 12 volt line provided to the motherboard.
- This cable added two more 12 volt lines so more of the load could be shifted to 12 volts.
- The power coming from this connector is usually used to power the CPU but some motherboards use it for other things as well.
- The presence of this connector on a motherboard means it's an ATX12V pin 12 V cable.

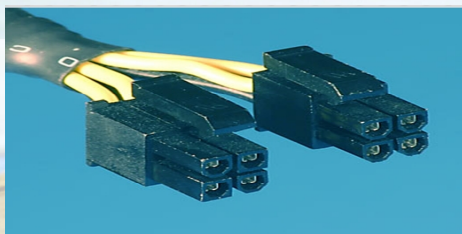


## 8 pin EPS +12 volt power cable "EPS12V" cable.



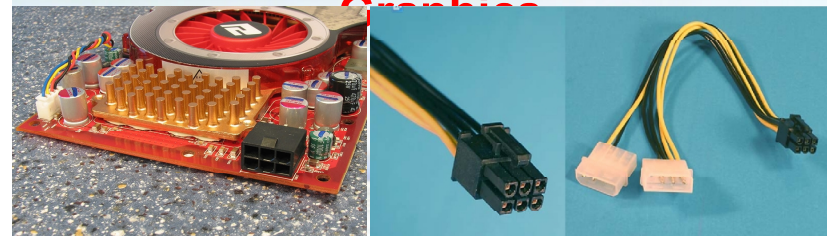
- This cable was originally created for workstations to provide 12 volts to power multiple CPUs
- But as time has passed many CPUs require more 12 volt power and the 8 pin 12 volt cable is often used instead of a 4 pin 12 volt cable.
- Depending on the power supply, the connector may contain one 12 volt rail in all 8 pins or two 12 volt rails taking up 4 pins apiece
- You can also plug an 8 pin 12 volt cable into a 4 pin 12 volt motherboard connector

## 4+4 pin +12 volt power cable



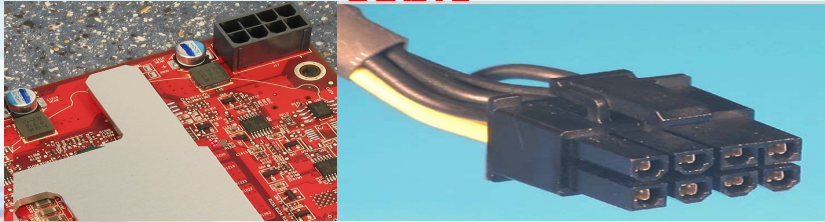
- Motherboards can come with either a 4 pin 12 volt connector or an 8 pin 12 volt connector.
- Many power supplies come with a 4+4 pin 12 volt cable which is compatible with both 4 and 8 pin motherboards.

## 6 pin PCI Express power cable "PEG" stands for PCI Express



- This cable is used to provide extra 12 volt power to PCI Express expansion cards.
- PCI Express motherboard slots can provide a maximum of 75 watts.
- Many video cards draw significantly more than 75 watts so the 6 pin PCI Express power cable was created.

## 8 pin PCI Express power cable

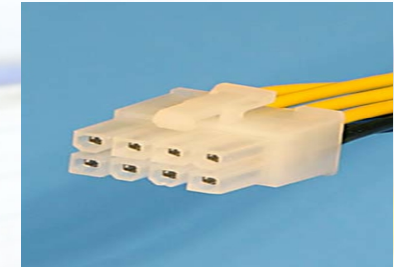
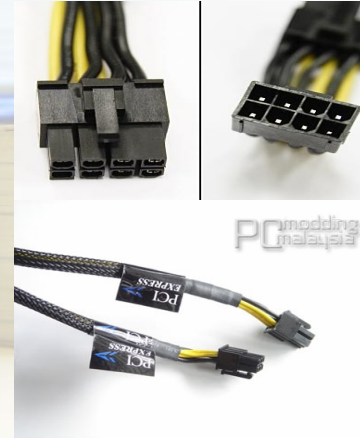


- The PCI Express 2.0 specification released in January 2007 added an 8 pin PCI Express power cable.
- It's just an 8 pin version of the [6 Pin PCI Express power cable](#).
- Both are primarily used to provide supplemental power to video cards.
- The older 6 pin version officially provides a maximum of 75 watts (although unofficially it can usually provide much more) whereas the new 8 pin version provides a maximum of 150 watts.
- It's okay to plug a 6 pin PCI Express power cable into an 8 pin PCI Express connector. It's designed to work that way but will be limited to the lower wattage provided by the 6 pin version of the cable.

## Caution 4

8 pin PCI Express power cable

8 pin EPS +12 volt power cable  
"EPS12V" cable.



connectors are polarized differently

## 6+2 pin PCI Express power cable



- Some video cards have [6 Pin PCI Express power connectors](#) and others have [8 Pin PCI Express power connectors](#).
- Many power supplies come with a 6+2 PCI Express power cable which is compatible with both kinds of video cards.

Power connectors included with various kinds of PCs		
Version	Introduction date	Included connectors
PC	1981	<a href="#">original PC main power cables</a> <a href="#">4 pin peripheral cable</a>
ATX	1995	<a href="#">20 pin main power cable</a> <a href="#">4 pin peripheral cable</a> <a href="#">floppy cable</a>
ATX12V 1.0	2000	<a href="#">20 pin main power cable</a> <a href="#">4 pin 12 volt cable</a> <a href="#">6 pin auxiliary cable</a> <a href="#">4 pin peripheral cable</a> <a href="#">floppy cable</a>
ATX12V 1.3	2003	<a href="#">20 pin main power cable</a> <a href="#">4 pin 12 volt cable</a> <a href="#">6 pin auxiliary cable</a> <a href="#">SATA cable</a> <a href="#">4 pin peripheral cable</a> <a href="#">floppy cable</a>
ATX12V 2.0	2003	<a href="#">24 pin main power cable</a> <a href="#">4 pin 12 volt cable</a> <a href="#">6 Pin PCI Express power cable</a> <a href="#">SATA cable</a> <a href="#">4 pin peripheral cable</a> <a href="#">floppy cable</a>
EPS12V	2003	<a href="#">24 pin main power cable</a> <a href="#">8 pin 12 volt cable</a> <a href="#">6 Pin PCI Express power cable</a> <a href="#">SATA cable</a> <a href="#">4 pin peripheral cable</a> <a href="#">floppy cable</a>
PCI Express 2.0	2007	<a href="#">24 pin main power cable</a> <a href="#">4 pin 12 volt cable</a> <a href="#">8 pin 12 volt cable</a> <a href="#">6 Pin PCI Express power cable</a> <a href="#">8 Pin PCI Express power cable</a> <a href="#">SATA cable</a> <a href="#">4 pin peripheral cable</a> <a href="#">floppy cable</a>



## Using AC Adapters

- laptops typically do not have the internal space to support such a large power supply.
- Most laptop AC adapters are external and have the job of converting the building power to a voltage that is required by the laptop.
- Laptops typically require between 12V and 20VDC.
- The laptop then has internal components that divide this incoming voltage into segments that are appropriated for the internal devices, such as 12V, 5V, and 3.3V. This allows for part of the power management components to exist outside of the laptop.

